

## When the Attack Comes Before the Asthma

### Violence Increases Risk from Pollution

Chronic physical or emotional stress is known to impair the immune system, a link that may explain some of the health disparities found among different socioeconomic groups. Researchers have also found that living in poor, urban communities or near highways is linked to a greater risk of developing childhood asthma and other breathing



**Added burden.** Stress can compound the physiological effects of environmental pollutants such as nitrogen dioxide.

## Sperm Quality and Tap Water Disinfection By-Product Effects Not Supported

Chemicals used to disinfect water often contain chlorine, which can react with organic matter in the water to form compounds such as trihalomethanes (THMs) and haloacetic acids (HAAs), known collectively as disinfection by-products (DBPs). DBP exposure has been implicated in reproductive abnormalities, and earlier human studies have found associations between DBPs and adverse pregnancy outcomes. A new study of DBP exposure now shows only weak evidence of sperm quality damage from exposures at or below regulatory limits [*EHP* 115:1169–1176; Luben et al.].

Earlier studies have revealed little about the degree of risk from DBP exposure, especially for male reproductive health, and there have been few epidemiologic studies of the possible effects on sperm quality. Rodent studies suggest that drinking water exposure to HAAs, particularly brominated species, could pose a threat to human sperm. Because some DBPs are considered carcinogens, there is also concern about DNA damage.

The current study assessed 228 men recruited from couples participating in a project to determine whether DBPs affect spontaneous abortion. The study population was drawn from three locations: one with a water supply containing low overall DBPs, one with low brominated but moderate chlorinated DBPs, and one with low chlorinated but moderate brominated DBPs. “Moderate” was defined as close to but below the U.S. EPA limits for four THMs and five

problems. A new study now reveals that psychosocial stressors may increase children’s vulnerability to the effects of traffic-related air pollution [*EHP* 115:1140–1146; Clougherty et al.].

The researchers examined data from the Maternal–Infant Smoking Study of East Boston, which began in 1987 to establish a cohort of pregnant women. In 1997, parents or guardians of 417 children of the cohort, then aged 4 to 11.5, answered questions about the children’s exposure to violence. Respondents were asked about the frequency with which the children had ever seen hitting, a shooting, or a stabbing, or heard domestic verbal abuse or gunshots. Other studies have suggested that residual trauma from witnessing episodic violence is a source of chronic stress for urban residents.

About 45% of the children had witnessed at least one violent act, and almost 20% had witnessed at least two. Responses were generalized to account for variables that can affect the severity of such acts, including whether the child knew the victim or perpetrator.

The researchers then acquired data collected between 1987 and 2004 on Boston levels of nitrogen dioxide (NO<sub>2</sub>), a constituent of vehicular exhaust with a known link to asthma. They used computerized mapping tools to estimate NO<sub>2</sub> exposure at the children’s residences in East Boston, a working-class urban neighborhood with highways running through it.

About 25% of the children in the study had asthma. However, residential exposure to NO<sub>2</sub> was linked to asthma only among children who were above the median for exposure to violence. The association between asthma and NO<sub>2</sub> exposure disappeared when the researchers looked at the group as a whole.

The authors conclude that their findings “indicate ancillary effects of violence on children in addition to direct injury and post-traumatic stress.” Larger studies are needed to investigate other possible interactions among risk factors for asthma. It is also important to study the effects of other pollutants, including indoor air pollution. The authors observe that accurate reports about violence are difficult to obtain, and that violence exposures may be a sign of other problems with family stability that affect stress levels and health. **–Tina Adler**

HAAs. The study also analyzed total organic halides (TOX), a group that includes THMs, HAAs, and other organic halides that may not have been identified individually.

Researchers surveyed participants to determine the amount of tap water they ingested and the frequency and length of their showers and baths, then calculated individual DBP exposure estimates. The men also provided semen samples, which the researchers analyzed for total sperm count, sperm maturity and morphology, and DNA integrity.

Expecting more sperm damage at higher DBP exposures, the researchers found instead that the top 25th percentile for both THM and HAA exposure had higher sperm counts than those in the bottom 50th percentile of each group. Results for sperm morphology and DNA integrity were similar. Sperm concentration did decrease as exposure to TOX increased, consistent with findings that TOX may be a greater risk factor for pregnancy difficulties than the individual compounds or groups of compounds now regulated. However, if this were the case, an increase in abnormal sperm morphology with increasing TOX would be expected, and no such increase was observed.

Because the study population was presumed fertile, a small decrease in sperm count might not be detectable against high background counts, and could explain the null results reported by the authors. Because only a few men were exposed to DBPs above regulatory limits, further clarification might be obtained by future studies including a wider range of exposures. **–Valerie J. Brown**

## Recipe for High Blood Pressure

### Synergistic Effects of Stress and Lead

Human research has shown associations between lead exposure and hypertension as well as between stress and hypertension. A new study now shows for the first time that stress amplifies the effects of lead exposure on blood pressure in humans [*EHP* 115:1154–1159; Peters et al.].

National Heart, Lung, and Blood Institute guidelines define high blood pressure as systolic pressure over 140 mmHg or diastolic pressure over 80 mmHg. Systolic pressure tends to rise with age whereas diastolic pressure tends to decline. High readings of either type significantly raise the risk of stroke and coronary disease.

A multi-institutional team examined data from 513 participants in the Normative Aging Study, a longitudinal study of men in the greater Boston area begun in 1963. Using data from the period 1987–1996, the researchers compared blood pressure status with self-reported stress levels (determined by questionnaires) and body burden of lead (determined by bone lead tests). About half the participants did not have hypertension; for this group the researchers analyzed follow-up data until 2004 or the participants developed hypertension, whichever came first. In the latter group, 97 new cases of hypertension were observed.

The study participants averaged 66.9 years of age. This put them in the age group most likely to have high systolic pressure, and meant they were old enough to have been exposed to significant amounts of lead before public policy changes in the 1970s reduced environmental lead from gasoline, paint, and other sources.

After accounting for other known hypertension risk factors, including age, body mass index, family history, and alcohol consumption, the researchers found that the effect of lead was “most pronounced among highly stressed individuals, independent of demographic and behavioral risk factors.” Among those reporting high stress, the risk of developing hypertension was more than 2.5 times that of participants reporting low stress for each standard deviation increase in bone lead. The current study was consistent with previous research suggesting that lead and stress affect only systolic pressure.

The authors note that their study does not address lead’s potential effects at various life stages. For example, early exposure leading to neurological damage might make people more likely to experience events as stressful. In addition, the study was limited in that participants were all male, were 97% white, and had higher than median incomes. Given that both lead exposure and stress tend to be elevated in lower socioeconomic strata, their effects on blood pressure may be more serious in those populations. —Valerie J. Brown

## Another Test for Lead Effects

### Early Childhood Exposure Influences End-of-Grade Scores

Low-level lead exposure has been linked to decreased aptitude—or ability to learn—on standardized IQ tests for school-aged children. Moreover, research studies have suggested that declines in aptitude occur at blood lead levels below the current CDC blood lead action level of 10 µg/dL. Now a team of scientists has studied how lead exposure affects educational achievement—how well children have mastered material taught in school [*EHP* 115:1242–1247; Miranda et al.]. The results show that blood lead levels far lower than 10 µg/dL in early childhood correlate with lower educational achievement in elementary school as measured by performance on end-of-grade (EOG) tests.

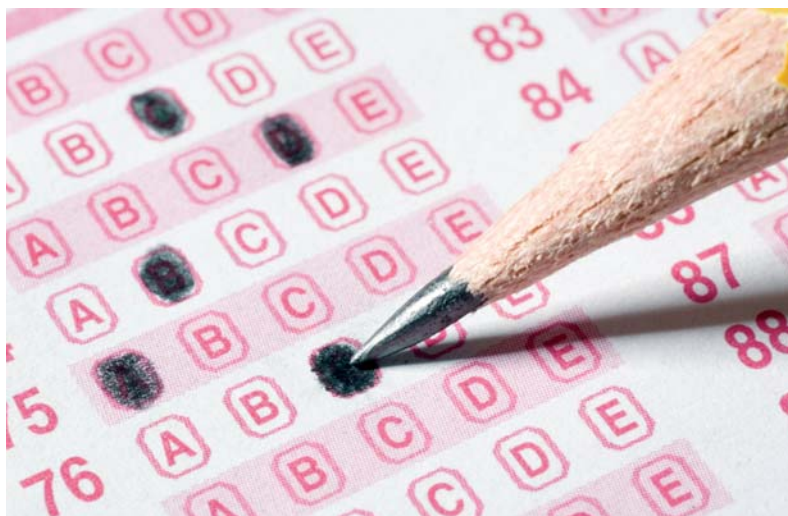
Data for the study came from two large databases generated by two different offices of the State of North Carolina for the same population but at different time periods. Blood surveillance data were provided by a state registry for seven adjacent North Carolina counties. The scientists used screening data from 1995 through 1998 for 35,815 children. For children who were screened more than once, the researchers used the highest blood lead level recorded. During this period, an estimated 21.9–30.4% of North Carolina children aged 1 and 2 years were screened for lead.

The North Carolina Education Research Data Center provided educational testing data from 2000–2004 for fourth-grade students in the seven-county study region. In North Carolina, each child in grades 3 through 8 takes a multiple-choice EOG test in reading and mathematics.

The researchers linked the two separate data sets to locate records of children who had been screened for lead and had also taken at least one EOG test. To ensure accuracy, the researchers used 16 different

combinations of identifiers, including Social Security numbers, date of birth, the county’s Federal Information Processing Standards code, and first and last name. This process linked 42.2% of screened children to at least one EOG record.

The scientists found a strong dose–response effect between early childhood lead exposure and performance on elementary school achievement tests. Childhood blood lead levels as low as 2 µg/dL at age 1 or 2 years had a discernible correlation with deficits in later EOG testing. A blood lead level of 4 µg/dL was associated with a significant decline in EOG reading and math scores, with an impact nearly equal to that of participating in the free or reduced lunch program, the classic poverty indicator in school data. The researchers want to follow the same children through their elementary, middle school, and high school years to assess the persistence of the effects found in this study. —John Tibbetts



**Another angle on lead.** Lead exposure has long been known to affect aptitude. New results show achievement also is at risk, and at levels below CDC recommendations.